

WHAT IS CLAIMED IS:

131

1. A solid electrolyte battery comprising:
  - a positive electrode;
  - a negative electrode disposed opposite to said positive electrode;
  - a separator disposed between said positive electrode and said negative electrode; and
  - solid electrolytes each of which is disposed between said positive electrode and said separator and between said separator and said negative electrode, wherein said separator is constituted by a polyolefine porous film, said polyolefine porous film has a thickness satisfying a range not smaller than 5  $\mu\text{m}$  nor larger than 15  $\mu\text{m}$  and a vacancy ratio satisfying a range not lower than 25 % nor higher than 60 %, and the impedance in said solid electrolyte battery is higher than the impedance realized at the room temperature when the temperature of said solid electrolyte battery satisfies a range not lower than 100°C nor higher than 160°C.
2. A solid electrolyte battery according to claim 1, wherein said porous polyolefine film contains polyethylene.
3. A solid electrolyte battery according to claim 1, wherein said solid electrolyte is a gel electrolyte containing swelling solvent.

4. A solid electrolyte battery according to claim 1, wherein said electrodes consist of a positive electrode using lithium ions as electrode reaction species and a negative electrode constituted by a carboneous material.

5. A solid electrolyte battery according to claim 3, wherein said solid electrolyte is a gel electrolyte containing ethylene carbonate, polypropylene carbonate and  $\text{LiPF}_6$ .

6. A solid electrolyte battery according to claim 5, wherein said solid electrolyte is a gel electrolyte further containing vinylene carbonate and/or 2, 4-difluoroanisol.

7. A solid electrolyte battery according to claim 6, wherein the content of each of vinylene carbonate and 2, 4-difluoroanisol is not higher than 5 wt% of the overall weight of said solid electrolyte.

8. A solid electrolyte battery according to claim 7, wherein a gel electrolyte is employed which is constituted by polyvinylidene fluoride or a copolymer of polyvinylidene fluoride.

9. A solid electrolyte battery according to claim 8, wherein a copolymer is

used which contains polyvinylidene fluoride and polyhexafluoropolypropylene.

10. A solid electrolyte battery according to claim 9, wherein said gel electrolyte is composed of a copolymer constituted by polyvinylidene fluoride and polyhexafluoropolypropylene such that polyhexafluoropolypropylene is contained in a quantity smaller than 8 wt%.

11. A solid electrolyte battery comprising:  
a positive electrode;  
a negative electrode disposed opposite to said positive electrode;  
a separator disposed between said positive electrode and said negative electrode; and  
solid electrolytes each of which is disposed between said positive electrode and said separator and between said separator and said negative electrode, wherein  
said separator is constituted by a polyolefine porous film, said polyolefine porous film has a thickness satisfying a range not smaller than 5  $\mu\text{m}$  nor larger than 15  $\mu\text{m}$ , a vacancy ratio satisfying a range not lower than 25 % nor higher than 60 %, breaking strength lower than 1650  $\text{kg}/\text{cm}^2$  and breaking ductility not lower than 135 %.

12. A solid electrolyte battery according to claim 11, wherein said porous

polyolefine film contains polyethylene.

13. A solid electrolyte battery according to claim 11, wherein said solid electrolyte is a gel electrolyte containing swelling solvent.

14. A solid electrolyte battery according to claim 11, wherein said electrodes consist of a positive electrode using lithium ions as electrode reaction species and a negative electrode constituted by a carboneous material.

15. A solid electrolyte battery according to claim 13, wherein said solid electrolyte is a gel electrolyte containing ethylene carbonate, polypropylene carbonate and  $\text{LiPF}_6$ .

16. A solid electrolyte battery according to claim 15, wherein said solid electrolyte is a gel electrolyte further containing vinylene carbonate and/or 2, 4-difluoroanisol.

17. A solid electrolyte battery according to claim 15, wherein the content of each of vinylene carbonate and 2, 4-difluoroanisol is not higher than 5 wt% of the overall weight of said solid electrolyte.

18. A solid electrolyte battery according to claim 17, wherein a gel electrolyte is employed which is constituted by polyvinylidene fluoride or a copolymer of polyvinylidene fluoride.

19. A solid electrolyte battery according to claim 18, wherein a copolymer is used which contains polyvinylidene fluoride and polyhexafluoropolypropylene.

20. A solid electrolyte battery according to claim 19, wherein said gel electrolyte is composed of a copolymer constituted by polyvinylidene fluoride and polyhexafluoropolypropylene such that polyhexafluoropolypropylene is contained in a quantity smaller than 8 wt%.

~~21.~~ A solid electrolyte battery comprising:  
a positive electrode;  
a negative electrode disposed opposite to said positive electrode; a separator disposed between said positive electrode and said negative electrode; and  
solid electrolytes each of which is disposed between said positive electrode and said separator and between said separator and said negative electrode, wherein  
said separator is constituted by a composite material of polyethylene and polypropylene, said polyolefine porous film has a thickness satisfying a range not smaller than 5  $\mu\text{m}$  nor larger than 15  $\mu\text{m}$ , the shutdown temperature is substantially the

same as the shutdown temperature of a separator constituted by polyethylene and the meltdown temperature is higher than the meltdown temperature of a separator constituted by polypropylene by a range satisfying a range not lower than 10°C nor higher than 30°C.

22. A solid electrolyte battery according to claim 21, wherein said solid electrolyte is a gel electrolyte containing swelling solvent.

23. A solid electrolyte battery according to claim 21, wherein said electrodes consist of a positive electrode using lithium ions as electrode reaction species and a negative electrode constituted by a carboneous material.

24. A solid electrolyte battery according to claim 22, wherein said solid electrolyte is a gel electrolyte containing ethylene carbonate, polypropylene carbonate and  $\text{LiPF}_6$ .

25. A solid electrolyte battery according to claim 24, wherein said solid electrolyte is a gel electrolyte further containing vinylene carbonate and/or 2, 4-difluoroanisole.

26. A solid electrolyte battery according to claim 25, wherein the content of

each of vinylene carbonate and 2, 4-difluoroanisole is not higher than 5 wt% of the overall weight of said solid electrolyte.

27. A solid electrolyte battery according to claim 26, wherein a gel electrolyte is employed which is constituted by polyvinylidene fluoride or a copolymer of polyvinylidene fluoride.

28. A solid electrolyte battery according to claim 27, wherein a copolymer is used which contains polyvinylidene fluoride and polyhexafluoropolypropylene.

29. A solid electrolyte battery according to claim 28, wherein said gel electrolyte is composed of a copolymer constituted by polyvinylidene fluoride and polyhexafluoropolypropylene such that polyhexafluoropolypropylene is contained in a quantity smaller than 8 wt%.

~~30.~~ A solid electrolyte battery comprising:  
a positive electrode;  
a negative electrode disposed opposite to said positive electrode;  
a separator disposed between said positive electrode and said negative electrode; and  
solid electrolytes each of which is disposed between said positive electrode and

said separator and between said separator and said negative electrode, wherein

said separator is formed by bonding a first separator constituted by polyethylene and a second separator constituted by polypropylene to each other, said separator has a thickness satisfying a range not smaller than 5  $\mu\text{m}$  nor larger than 15  $\mu\text{m}$  and said separator has a shutdown temperature which is substantially the same as the shutdown temperature of a separator constituted by polyethylene and a meltdown temperature which is substantially the same as the meltdown temperature of a separator constituted by polypropylene.

31. A solid electrolyte battery according to claim 30, wherein said solid electrolyte is a gel electrolyte containing swelling solvent.

32. A solid electrolyte battery according to claim 30, wherein said electrodes consist of a positive electrode using lithium ions as electrode reaction species and a negative electrode constituted by a carboneous material.

33. A solid electrolyte battery according to claim 31, wherein said solid electrolyte is a gel electrolyte containing ethylene carbonate, polypropylene carbonate and  $\text{LiPF}_6$ .

34. A solid electrolyte battery according to claim 33, wherein said solid



electrolyte is a gel electrolyte further containing vinylene carbonate and/or 2, 4-difluoroanisol.

35. A solid electrolyte battery according to claim 34, wherein the content of each of vinylene carbonate and 2, 4-difluoroanisol is not higher than 5 wt% of the overall weight of said solid electrolyte.

36. A solid electrolyte battery according to claim 35, wherein a gel electrolyte is employed which is constituted by polyvinylidene fluoride or a copolymer of polyvinylidene fluoride.

37. A solid electrolyte battery according to claim 36, wherein a copolymer is used which contains polyvinylidene fluoride and polyhexafluoropolypropylene.

38. A solid electrolyte battery according to claim 37, wherein said gel electrolyte is composed of a copolymer constituted by polyvinylidene fluoride and polyhexafluoropolypropylene such that polyhexafluoropolypropylene is contained in a quantity smaller than 8 wt%.